# Trust in requirements elicitation

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# Trust in Requirements Elicitation: How Does it Build, and Why Does it Matter to Requirements Engineers?

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## ABSTRACT

Elicitation is a process during Requirements Engineering (RE) which intends to identify requirements and information about a system and its domain. It relies heavily on communications and interactions between engineers and stakeholders. One significant variable influencing the effectiveness such communication is Trust. While this very idea has been widely covered in many fields of research, little attention has been paid in RE to the potential influence of trust on the elicitation effort, and therefore on the overall RE success. This paper intends to fill in this gap by providing a first empirical study on the impact of trust during requirements elicitation and by proposing a first definition of trust in the engineers and trust in the stakeholders during RE.

## Keywords

Elicitation, Trust, Stakeholders, Engineers, Empirical Study

## 1. INTRODUCTION

Requirements Engineering (RE) is dedicated to the understanding and documentation of what stakeholders expect from a future information system, and to the specification of a system that actually meets those expectations [1]. One early, critical, activity during RE is Requirements Elicitation, or simply elicitation hereafter. Elicitation is the process of collecting information about requirements of the stakeholders, and about the conditions in which the system-to-be will operate. Elicitation intends to minimize implicit information about the system-to-be. Implicit information is the information that an engineer did not manage to elicit, but which, if correctly documented, could have been useful during RE. To reduce the risk of implicit information, elicitation relies on direct communication with stakeholders via techniques like interviews, prototyping, surveys, observations, etc. [2, 3, 4, 5]. In this paper, we investigate the impact of trust on the effectiveness of elicitation. In fact, evidences are numerous that trust can have significant impact on information exchange [6, 7] and information disclosure [8, 9]. Beside, this is an intuitively appealing idea; trust shapes our behavior towards other people in many, if not most situations. Typically, we would not share much relevant information with people which we do not trust. Our idea is therefore that trust is one possible variable that influences the amount of implicit information during requirements elicitation. Research on trust is hardly new; the topic has been addressed in various fields like psychology, management, marketing research [10, 11, 12]. Yet, the settings of elicitation communication and the relationship that exists between requirements engineers and stakeholders - which is neither a proper buyer/seller relation, nor a proper employee/employer one - justifies the need to perform additional research on this topic. To the best of our knowledge, no research has been done in RE on the study of trust in the context of requirements elicitation.

Our objective in the present paper is twofold. A first preliminary step focuses on theory building by investigating some existing determinants of trust in the case of elicitation interviews. We start from a review of determinants of trust in other fields, and see how important these determinants are in RE. We do so from the perspective of the analyst and of the stakeholder. Our goal in that step of the research is to gain insight into what defines trust during elicitation, so as to help increase trust levels during RE projects. A second step focuses on the experimental testing of the theory, by investigating the impact of varying level of trust on implicit information. Our goal in that second step is to show that the trust one benefits during elicitation actually matters, and influences what information is likely to become explicit, and which information presents more risk to remain implicit. The main contribution of this paper is the empirical exploration of the concept of trust during elicitation, and the definition of more specific research questions to be investigated in future work.

The remainder of this paper is structured as follows. In Section 2, we cover related work and identify a series of determinants of trusts from fields like management sciences, psychology, etc. In Section 3, we provide a definition of trust in the context of requirements elicitation and describe the rationale for our empirical design. In Section 4, we present our research method in more details. In Section 5, we present and discuss our results. Finally, we discuss the limitations of our research and the future works in Section 6, and provide a conclusion in Section 7.

## 2. RELATED WORK

There is no one single definition of trust [13, 14, 11, 15]: in practice, the definition of trust mostly depends on the application domain being considered. It is possible however to find important commonalities between the different definitions of trust in psychology and management sciences, which can be used as a groundwork for clarifying the definition of trust that this paper adopts. Firstly, there is agreement on the fact that trust is a dyadic relationship; it involves two people, referred to as Trustor (the one who trust) and Trustee (the one who is trusted) [16, 17, 18]. Secondly, it is common to consider trust as a subjective evaluation made by the trustor over the trustee [19]. In [20] for example, trust is defined as "the perceived credibility and benevolence of a target of trust". The definition emphasizes the perception aspect of trust: trust is not the result of an objective process, but is the result of some sensations from the trustor about the trustee. Thirdly, trust systematically follows from an intention. In [21], trust is defined as "the willingness to rely on an exchange party in whom one has confidence", thereby emphasizing the necessity of a voluntary trustor. Fourthly, trust implies vulnerability [12]. In [11], authors define trust as "the willingness of a party to be vulnerable to the actions of another party [...]". The definition clearly states that a trustor is vulnerable to some risk when trusting the trustee. Vulnerability is also a common trait of trust in the context of online systems: "an attitude of confident expectation in an online situation of risk that one's vulnerabilities will not be exploited" [22].

Trust during Software Engineering (SE) is hardly a new topic [23], and is understood as the trust a user has in the system under consideration. Examples are self-speaking in fields like e-commerce, e-science or other collaborative applications where the concept of online-trust has been widely covered [24, 22]. For businesses indeed, it is critical that users trust their e-systems enough, so as to make them sufficiently confident and ensure they will purchase some goods or services [25, 26], and empirical studies on the topic are numerous [27]. The study of trust in SE also covers other aspects such as software security [28] or privacy [29].

In RE, trust is also acknowledged as a critical success factor of systems [30]. Typically, trust requirements are used in RE to express the necessity for users to trust the system they use. Trust requirements must be accounted for by engineers, because they typically reflect the specific security and privacy assumptions stakeholders are making when using the system [31, 32]. Trust assumptions are decisions of the engineers to have confidence in some characteristics of domains [33, 34], and can be used as a groundwork for the formulation of explicit trust requirements. Modeling trust is a challenge that is addressed in RE, with the objective to treat and analyze security and trust requirements in relation with standard RE concepts like goals or actors. In [18], trust is modeled using the standard i* concept of softgoal. Several extensions to i* have also been proposed to support reasoning about trust [35, 36, 37, 38]. To the best of our knowledge, no research has gone on the implications of trust as a factor influencing the communication between stakeholders and engineers, and more precisely the disclosure of requirements during elicitation.

## 3. TRUST IN RE AND ELICITATION

Based on the works discussed in previous section, we define more precisely the concept of trust in requirements elicitation. For the sake of readability, in the rest of this paper we distinguish the concept of Trust in the Engineer from the concept of Trust in the Stakeholders. This distinction directly follows from the dyadic property of trust; trust involves two agents trusting each other, and that trust is not expected to be symmetric [15], e.g., A can trust B without B trusting A. The two types of trusts are defined as follows:

- *Trust in the Engineer (TIE)*: intention of a stakeholder to accept being vulnerable to some perceived risks by working with a given analyst who is in charge of collecting, treating and documenting his/her requirements;
- *Trust in the Stakeholder (TIS)*: intention of an analyst to accept being vulnerable to some perceived risks by collecting from a given stakeholder information about requirements from a system-to-be and/or information about the environment of that system-to-be.

TIE and TIS are likely not given and fixed over time; they are the result of people's perception, are subjective, and can therefore be influenced [39]. This leads to the question of what determines TIE and TIS during requirements elicitation, which is the first research question of this paper; we try to understand how TIE and TIS build during requirements elicitation. Beside, we also want to study how TIE and TIS influence the disclosure of information during requirements elicitation. We summarize these two questions below:

- *Research Question 1*: What are the determinants of Trust in the Engineer (TIE) and Trust in the Stakeholder (TIS), in a context of requirements elicitation?
- *Research Question 2*: What is the impact of Trust in the Engineer (TIE) and Trust in the Stakeholder (TIS) on the communication and documentation of information during requirements elicitation?

There has been significant attention paid to the precedence of trust, in various fields such as Management [40], Marketing [20], Market Research [41], E-Commerce [26] or Economics [42]. A list of most frequent precedence factors of trust is reported in Table 1, with a reference to the paper (and hence to the field) in which they have been advanced and the type of determinant. The type of a determinant refers to whether it is related to a person, an attitude of a person or the company for which the person works. In addition, we also suggest two levels for each determinant, i.e., a determinant can be either high or low. We make that distinction because we want to study the symmetry between the two levels of a same determinant in elicitation; our idea is that one can highly trust a person with a determinant A, but not systematically highly distrust a person without that same determinant A, e.g., the fact that a stakeholder trusts an engineer who is experienced does not mandatorily involve that the stakeholder will distrust an engineer who is not experienced.

**Table 1: List of Precedence Factors**

| Factor | High vs. Low | Description | Butler 1991 | Doney 1997 | Moorman 1993 | Mcknight 2002 | Sako 1998 |
|---|---|---|---|---|---|---|---|
| Expertise | Expert vs. Novice | the Trustor believes the words or written statements of the Trustee can (cannot) be relied on, due to (lack of) knowledge background | | X | X | | |
| Likability | Friendly vs. Unkind | the Trustor finds the Trustee friendly (unfriendly), and find it pleasant (unpleasant) to spend time with the latter. | | X | | X | |
| Power | Manager vs. Employee | the Trustee occupies a job that implies relatively high (low) responsibilities and hierarchical power. | | X | X | | |
| Commitment | Concerned vs. Uncaring | the Trustee sees the collaboration with the Trustor as a long-term (short-term) relationship. | X | | | | X |
| Loyalty | Devoted vs. Distant | the Trustee has (no) time to devote to the Trustor, and is (not) actually willing to help the latter to solve its problems. | | X | | X | |
| Consistency | Directed vs. Undirected | the Trustee is constant (unsteady) about the design decisions made in the past, and/or avoids (makes) unexpected changes. | X | X | | | |
| Receptivity | Open-minded vs. Conservative | the Trustee welcomes (rejects) new ideas and listen to (discourages) additional remarks about the system-to-be. | X | | | X | |
| Reciprocity | Advisor vs. Collector | the Trustee provides (keeps) information to (from) the Trustor, and do not (do) only collect information from the latter. | | X | | | X |
| Structure | Large vs. Small | the business of the Trustee is large (small), with many (few) sub-entities such as teams, groups, departments, etc. | | X | X | | X |
| Culture | Convergent vs. Divergent | the business of the Trustee has a vision of the world and a set of values that fit (do not fit) with those of the Trustor. | | X | X | | X |
| History | Collaboration vs. Project | the business of the Trustee has a long (short) experience of collaboration with the company of the Trustor. | | X | | | X |
| Positive Reputation | Renown vs. Unknown | the business of the Trustee has been successful in many different (few) projects similar to the one of the Trustor. | | X | X | | X |

As explained in our introduction, a research objective in this paper is to investigate whether or not trust is an important variable in the decision of stakeholders to disclose or not information during elicitation. While the importance of trust has been clearly demonstrated in other fields [6, 7, 8, 9], nothing permits to conclude these results also apply in RE. One possible way to explore TIE/TIS is to look at how engineers/stakeholders behave toward information shared by stakeholders/engineers, when they have a certain level of trust in that stakeholders/engineers. More specifically, we find it interesting to observe what level of trust is required from both stakeholders and engineers in order for a piece of information to be correctly elicited. Our premise here is that some pieces of information may require more trust than others in order to be elicited correctly; for example, a stakeholder may be reluctant to share information about the business strategy when she mistrusts the engineer interviewing her. Similarly, an engineer might be reluctant to consider the information being provided by a stakeholder that she does not trust due to low power. We build on research related to elicitation interviews. In [43], the importance of various topics during elicitation is studied. The topics are studied in terms of how spontaneously they are being shared by stakeholders during elicitation interviews. The latter research provides the groundwork for studying the impact of trust on elicitation incompleteness. From the thirty topics being studied in [43], we select the six most explicit and the six most implicit topics and use them in the present study. We did not select more topics to keep the study short and ensure a maximum of answers. Topics are listed in Table 2, starting with most explicit ones.

# 4. RESEARCH METHOD

In next subsections, we describe with more details the sampling of subjects and the procedure we adopted to collect our data and test our two main research questions.

## 4.1 Sample

Our research questions are related to both TIE and TIS. This implies data had to be collected from both stakeholders and engineers. For subjects taking part to the TIS study, we targeted business analyst profiles only; that is, any person who "works within the context of IT projects - projects to buy, purchase, or modify some software" and who "liaises with business and technical stakeholders and is responsible for gathering the requirements that originate from the business" [44]. To ensure ecological validity of our data, we only collected data from business analysts being part of a RE project at the moment of the survey, and asked them to consider the context of their project as a baseline to answer our questionnaire. Answers were collected from business analysts in two different teams at SMALS and KUL ICTS. These are two organizations in charge of various IT projects respectively for federal institutions and university campuses in Belgium. We collected data from 35 business analysts. For subjects taking part to the TIE study, we targeted any stakeholder of a RE project. Again, we involved stakeholders of projects at SMALS and KUL ICTS to ensure ecological validity of our data. We asked business analysts who participated to the TIS study to involve stakeholders of their projects in the study. Profiles are extremely varied, ranging from regular employee positions to managers and project leads. We collected data from 22 stakeholders.

Table 2: List of Interview Topics Investigated in our Study

| Top 6 Most Explicit Topics from [43] | Top 6 Most Implicit Topics from [43] |
|---|---|
| The reason why the new system is needed | The hierarchical level (power) of the users of the system |
| The financial and IT strategy of stakeholder's company | The relationships that exist between users |
| The various actors who will use the future system | The best practices in the business of the customer |
| The departments and teams that form the company | The laws/standards applicable in the stakeholder's business |
| The locations where the system should be accessed | The measures used to evaluate system's success |
| The history and evolution of stakeholder's company | Specific facts/elements about your customer |

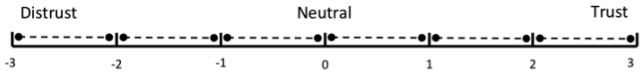



**Figure 1: Scale of Trust Adapted from [45]**

## 4.2 Design

Our study took the form of two online questionnaires; a TIE study submitted to stakeholders, and a TIS study submitted to engineers. Both questionnaires had the same structure. In a first part, the goal was to clarify the context of the study and define important concepts.

In a second part, the objective was to study the determinants of trusts during elicitation. To do so, we asked the stakeholders/engineers to consider an engineer/stakeholder with some characteristics, and to evaluate the elicitation trust he/she would have in that person depending on that characteristic. The characteristics are the different levels of each determinant of trusts listed in Table 1. For example, in the TIS study, engineers were asked to evaluate the level of trust they would have during elicitation in a person that is Friendly, in a person that is Unkind, and in a person that is neither Friendly nor Unkind. All levels of trust determinants were randomly displayed on screen, to avoid bias in the study. To evaluate the levels of trust, stakeholders were provided with a scale of trust, initially suggested in [45]. The scale varies from total mistrust (-3) to total trust (+3), and provides five intermediary levels. The graphical representation of the scale, as it appeared in the questionnaire, is presented in Figure 1. Notice that it takes the form of a rule, so that subjects are conscious of the scale and of the different levels available. Stakeholders were explicitly told there was no constraints on the evaluation of the levels; they could choose to trust all the levels, remain neutral for each level, have only one highly trusted level, etc.

In a third and last part, the objective was to evaluate the level of trust that an engineer/stakeholder expects to have in a stakeholder/engineer in order to collect/communicate information about a particular topics. The different topics that are tested in this paper are those summarized in Table 2. For example, in the TIE study, stakeholders were asked to evaluate the level of trust they would expect from an engineer in order to share with her information related to the various actors who will use the system. The same scale as in part two was used (see Figure 1).

## 4.3 Procedure

We adopted a four-steps approach to collect our data. First, we ran a preliminary round of data collection, the purpose of which was to test our survey design and ensure the questionnaire was sufficiently clear. We collected answers from a dozen people, all students and members of the University of Namur. The preliminary study was helpful, in that in enabled to clarified definitions and assignments which were misleading. Second, we invited business analysts from SMALS and KUL ICTS to take part to a short presentation. During those presentations, we clarified the objectives of our research, clarified important concepts, described our survey and asked for participation. We also answered to questions from subjects about the survey and our research questions. Both sessions lasted for approximately 30 minutes, and were organized as a meeting onsite or via a conference-call. Third, we sent the link to our TIS study and invited business analysts to participate. Fourth, we asked business analysts to share the TIE study questionnaire with their stakeholders, and answer questions they would have about the study. We did not intervene in the data collection process on that stage, which explains the relatively small number of participants in this stage of the research.

# 5. RESULTS

## 5.1 Determinants of TIS and TIE

The data we collected in our TIS and TIE studies provide measures of trust from various subjects under various conditions, i.e., for each determinant of trust, measures are collected for the low, high and intermediate (neither high nor low) levels. Our first research question (RQ1) can be answered by verifying that, depending on the level of determinants, the trust evaluations made by subjects significantly differ. To do so, we can consider that the measure of trust under several levels of a same determinants are repeated measures, and as a consequence we can run repeated measures ANOVA to test for significant differences in trust evaluations. In Table 3, we report the results of the tests we ran for each determinant, for each type of trust. Since the sphericity assumption of ANOVA was violated in all cases, we ran several repeated measures ANOVA with a Greenhouse-Geisser correction. The tests determined that mean TIS/TIE variations differed statistically significantly between levels of trust determinants, for all determinants of trust considered in this study. This was an expected result, as it simply confirms former empirical research conducted in other fields [40, 20, 41, 26, 42].

The contribution of this part of the study is in the actual trust evaluations made by stakeholders and engineers. The average trust evaluations are reported in Table 4, for each determinants and each type of trust. A negative evaluation represents distrust, while a positive evaluation represents trust. The scale varies from -3 to 3.

It is possible to summarize Table 4 by defining three categories of determinants, corresponding to three different pat-

**Table 3: Result of Repeated Measure ANOVA with a Greenhouse-Geisser Correction**

| *Repeated Measure ANOVA* | *TIS (n=35)* | | | | *TIE (n=22)* | | | |
|---|---|---|---|---|---|---|---|---|
| | Df | Error | F | P-Value | Df | Error | F | P-Value |
| **Expertise** | 1.331 | 57.214 | 89.569 | 0.000 | 1.399 | 27.982 | 95.820 | 0.000 |
| **Likability** | 1.689 | 72.648 | 71.013 | 0.000 | 1.876 | 37.520 | 56.645 | 0.000 |
| **Power** | 1.432 | 61.595 | 8.811 | 0.002 | 1.793 | 35.869 | 38.214 | 0.000 |
| **Commitment** | 1.185 | 50.965 | 70.231 | 0.000 | 1.547 | 30.930 | 12.397 | 0.000 |
| **Loyalty** | 1.698 | 73.024 | 205.246 | 0.000 | 1.716 | 34.312 | 7.7646 | 0.003 |
| **Consistency** | 1.914 | 82.311 | 163.459 | 0.000 | 1.539 | 30.777 | 99.199 | 0.000 |
| **Receptivity** | 1.641 | 70.574 | 73.003 | 0.000 | 1.8 | 36.003 | 47.734 | 0.000 |
| **Reciprocity** | 1.757 | 75.558 | 67.491 | 0.000 | 1.837 | 36.733 | 3.794 | 0.035 |
| **Structure** | 1.771 | 76.146 | 19.897 | 0.000 | 1.701 | 34.024 | 24.255 | 0.000 |
| **Culture** | 1.244 | 53.476 | 69.340 | 0.000 | 1.903 | 38.062 | 56.279 | 0.000 |
| **Reputation** | 1.891 | 81.312 | 170.676 | 0.000 | 1.170 | 23.404 | 68.736 | 0.000 |
| **History** | 1.691 | 72.711 | 71.108 | 0.000 | 1.582 | 31.644 | 27.639 | 0.000 |

**Table 4: Summary of Trust Evaluations**

| *Determinant Average Evaluation* | *TIS (n=35)* | | | *TIE (n=22)* | | |
|---|---|---|---|---|---|---|
| | Low | Intermediate | High | Low | Intermediate | High |
| **Expertise** | -0.52 | 0.66 | 1.52 | -1.19 | 1.90 | -0.19 |
| **Likability** | -1.25 | 0.52 | 0.52 | 0.86 | 0.48 | -1.95 |
| **Power** | 0.02 | 0.05 | 0.61 | 0.29 | 0.10 | -1.86 |
| **Commitment** | -0.73 | 1.00 | 1.45 | -0.76 | 0.67 | -0.76 |
| **Loyalty** | -2.00 | 0.39 | 1.43 | 0.76 | 1.95 | 1.33 |
| **Consistency** | -2.23 | 0.41 | 1.09 | 0.71 | 2.14 | -1.90 |
| **Receptivity** | -1.73 | 0.98 | -0.45 | 1.71 | 0.52 | -1.76 |
| **Reciprocity** | -1.36 | -0.11 | 0.82 | 0.9 | 1.48 | 0.9 |
| **Structure** | -0.70 | 0.27 | -0.73 | 0.67 | -0.62 | -1.19 |
| **Culture** | -0.48 | 0.55 | 1.11 | 0.52 | 1.00 | -2.14 |
| **Reputation** | -1.27 | 0.43 | 1.77 | -1.62 | 1.29 | 2.33 |
| **History** | -0.02 | 0.95 | 1.75 | -0.05 | 0.76 | 1.29 |

terns of trust evaluations. A first pattern that we call "Higher is Better" gather all the determinants of trust for which it is better to have a higher level than a low level. Most TIS determinants are of this type. Fewer in the TIE study follow this trend. A second pattern is called "Avoid Extremes" and gathers all the determinants of trust for which it is better to have an intermediate level (neither high nor low). Surprisingly, most TIE determinants are of this type. A third pattern is called "Lower is Better" and gathers the determinants of trust for which it is better to have a low level. There are no TIS determinants in this category. Again, we find some TIE determinants in this pattern. Altogether, former observations enable to answer *RQ 1*.

## 5.2 Influence of TIS and TIE on Elicitation

Another result from our TIS and TIE study is the expected level of trust for the elicitation of some particular information (i.e., topics). The underlying idea is that some topics during elicitation may require more trust than others in order to be shared by stakeholders, or to be documented by engineers. We report in Table 6 the minimum, maximum and average expected TIS and TIE, for various topics. We also report the standard deviation, as a way to measure the agreement of subjects on their trust evaluation. Altogether, observations in Table 6 enable to answer *RQ 2*.

# 6. DISCUSSION

Previous results were useful to answer our two research questions *RQ1* and *RQ2*. In addition, they can also be used from a more practical point of view to advance some hypotheses about how trust can be leveraged during requirements engineering to maximize the chance of successful elicitation.

For example, the evaluations reported in Table 4 can be used for various purposes, depending on the type of trust. On the one hand, the table can be used as an indication of which characteristics should matter to engineers when working with stakeholders, and which are less important in order to maximize TIE. For instance, a company can increase TIE by sending engineers with higher reputation (+2.33), by building long-term collaboration and staying loyal to stakeholders (+1.33), or by avoiding too low expertise (-1.19). On the other hand, the table can be used as a way to be aware of how TIS builds. Such input could be useful to, for instance, select the stakeholders from which sensible information about requirements or the domain must be collected, or to detect more easily the stakeholders that are more likely to be distrusted by engineers, and from which information is more likely to not be documented. For instance, engineers could decide to involve stakeholders who have significant expertise (+1.52), who are not committed to the project (-0.73) or who are not consistent in their statements (-2.23) because they would distrust those stakeholders and would not have confidence in the information elicited from them.

Similarly, Table 6 can be used during elicitation to anticipate on topics which are more likely to remain implicit due to low TIE levels, or which require to be collected from stakeholders with high TIS, in order to be considered as valid and trustworthy by engineers. We learn from the Table that some topics do not require particular levels of trust; this is

**Table 5: Patterns of Trust Evaluation in Requirements Elicitation**

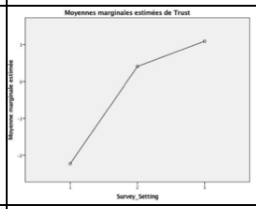
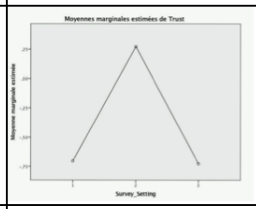
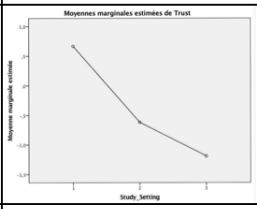
| | *Higher is Better* | *Avoid Extremes* | *Lower is Better* |
|---|---|---|---|
| **Pattern** |  |  |  |
| **TIS Determinants** | Commitment, Consistency Culture, Expertise, History, Likability, Loyalty, Power, Reciprocity, Reputation | Receptivity, Structure | |
| **TIE Determinants** | History, Reputation | Commitment, Consistency, Culture, Expertise, Loyalty Reciprocity | Likability, Power, Receptivity, Structure |

**Table 6: Summary of Trust Evaluations by Topics**

| *Field* | *TIS (n=35)* | | | | *TIE (n=22)* | | | |
|---|---|---|---|---|---|---|---|---|
| | *Min.* | *Max.* | *Mean* | *Std Dev.* | *Min.* | *Max.* | *Mean* | *Std Dev.* |
| The reason why your customer needs a the system | -3.00 | 3.00 | 0.91 | 1.60 | -3.00 | 3.00 | 0.11 | 2.00 |
| The financial and IT strategy of the customer | -1.00 | 3.00 | 1.34 | 1.07 | -3.00 | 3.00 | 1.40 | 1.71 |
| The various actors who will use the future system | -3.00 | 2.00 | 0.61 | 1.54 | -3.00 | 2.00 | -0.53 | 1.87 |
| The departments and teams that form the company of the customer | -3.00 | 2.00 | -0.30 | 1.45 | -3.00 | 2.00 | -1.22 | 1.65 |
| The locations where the system should be accessed by future users | -3.00 | 3.00 | 0.25 | 1.61 | -3.00 | 2.00 | -0.10 | 1.48 |
| The history and evolution of your client's company over the last ten years | -3.00 | 2.00 | -0.42 | 1.34 | -3.00 | 2.00 | -0.79 | 1.70 |
| The hierarchical level of the users of the system. | -3.00 | 3.00 | 0.28 | 1.53 | -3.00 | 2.00 | -0.45 | 1.47 |
| The relationships that exist between workers in the customer's company. | -2.00 | 3.00 | 1.05 | 1.32 | -3.00 | 3.00 | 1.05 | 1.72 |
| The best practices in the business of the client | -3.00 | 2.00 | 0.80 | 1.21 | -3.00 | 3.00 | -0.10 | 1.89 |
| The laws and other standards that are applicable in the business | -3.00 | 3.00 | 0.56 | 1.57 | -3.00 | 2.00 | -0.80 | 1.86 |
| The measures that the client uses to evaluate its internal success | -2.00 | 3.00 | 0.50 | 1.29 | -3.00 | 3.00 | 0.74 | 1.74 |
| Specific elements about the customer (e.g., employees all speak English,, the average age is below 35, there are more women than men, etc.) | -3.00 | 2.00 | -0.49 | 1.30 | -3.00 | 2.00 | -0.70 | 1.71 |

the case for instance for information related to the history and evolution of the company, details about the business or the structure of departments and teams within the company; these are typical examples of rather factual information, one can sometimes even collect from systems (like website, organization charts, ...). On the other hand, some topics are critical and require relatively higher level of TIS and TIE. This is the case for instance for financial and IT strategies, the relationships between workers in the company or the metrics being used to evaluate internal success; these are typical examples of more sensitive data.

Overall, we observe relative agreement between engineers and users on the expected level of respectively TIS and TIE across topics. Nevertheless, we see on average a lower standard deviation for the TIS than for the TIE; this might suggest engineers have a more unified view on levels of trust required than users, who seem to disagree more. A notable exception is the case of the actors who will use the system. Another exception is the laws and other standards applicable in a company. For these topics, engineers expect high level of TIS in order to collect the information, while stakeholders would agree to share the information with engineers, even if their TIE level is relatively low.

Another important conclusion following from our results is that, on average, the mean TIS (0.42) is much higher than the mean TIE (-0.11). This suggests that overall, during elicitation of requirements, more TIS is required than TIE. A possible explanation to this is that engineers are better aware of what can go wrong and therefore desire on average a higher level of trust in their stakeholders. Users on the other hand seem not to pay as much attention to trust in their engineers. From Table 6, we observe that average TIE rating is below 0, and we see that per item, 9 out of the 12 items request a TIE level lower than or equal to 0. This suggests that, overall, users are willing share information to any engineer, regardless of the level of trust that engineer benefits from. We should emphasize that former conclusion applies for any elicitation topic, unless it is related to some sensible topics such as finance or corporate strategy.

## 7. THREATS TO VALIDITY

Various threats to the validity of the results were identified. Most were threats to conclusion validity; we involved a relatively small number of subjects from only two organizations in our survey. This increases the risk of low statistical power and homogeneity of subjects. A threat to internal validity was the maturation of subjects in our TIS/TIE studies, since the same subjects were questioned repeatedly in different settings. As a consequence, there might be a bias due to repetitive tasks. We mitigated the risk of maturation by randomly displaying the determinants and their levels in the survey; two different subjects had the same levels to evaluate, but in different orders. We did not identify significant threats to the construct validity of our study. We favoured ecological validity over quantity, and designed a procedure to carefully control the experimental settings,

so as to guarantee high quality data. Finally, interaction of setting/selection and treatment threatened the external validity of our research; the simple nature of the trust evaluation task and the selection of subjects may not generalize to other RE settings. We acknowledge the limitations of our research, and emphasize the early nature of this research; our goal was not to conduct a sound empirical validation of trust determinants, but simply to demonstrate their relevance, and motivate additional validation effort. Overall, therefore, cautiousness is required when applying our results in different settings.

# 8. CONCLUSION AND FUTURE WORK

Elicitation trust is a dyadic relationship between a stakeholder in charge of sharing information, and an engineer in charge of collecting and documenting that information. In this paper, we investigated the concept of Trust in the Engineer (TIE) and Trust in the Stakeholder (TIS). We observed that precedence of trust as studied in other fields of research such as marketing, psychology or management sciences is similar in a context of requirements elicitation; factors like the likeliness, the loyalty or the experience of a person are strong determinants of trust. We however observed that some determinants of trust weight differently in the definition of TIS and TIE. For instance, some factors should be maximized (favour higher levels of the factor) while other have to be minimized or mitigated (favour lower or intermediate levels of the factor) in order to optimize the level of trust. In other words, we observed that higher levels of a determinant are not always leading to higher TIS and TIE; we summarized this idea by defining three different patterns of trust factors, which describe the way a factor is expected to influence TIS and TIE . Another observation we made is that different elicitation topics will be treated differently by stakeholders and engineers, depending on the trust level of the engineers and stakeholders involved in the elicitation process.

Our plan for future work is to work on the limitations of the present student, which are inherent to the exploratory approach adopted in this paper. We plan to continue working on the list of determinants of trust we identified. Our objective is to identify additional determinants and levels of trust, and to test them in more representative elicitation settings. We also intend to clarify the actual aspect of trust on the disclosure of information, to test additional requirements topics and to evaluate the impact of different elicitation techniques on the importance of TIS and TIE.

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